Docket No. 50090-334

PATENT

#10
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of :

Masanobu IWASAKI, et al. :

Serial No. 09/934,474 : Group Art Unit: 3723

Filed: August 23, 2001 : Examiner: H. Shakeri

For: POLISHING SOLUTION SUPPLY SYSTEM, METHOD OF SUPPLYING POLISHING SOLUTION, APPARATUS FOR AND MEHTOD OF POLISHING SEMICONDUCTOR SUBSTRATE AND METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE

TRANSMITTAL OF APPEAL BRIEF

Commissioner for Patents
Washington, DC 20231

Sir:

Submitted herewith in triplicate is Appellant(s) Appeal Brief in support of the Notice of Appeal filed September 4, 2002. Please charge the Appeal Brief fee of $320.00 to Deposit Account 500417.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

Arthur J. Steiner
Registration No. 26,106

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 AJS:ntb
Date: November 4, 2002
Facsimile: (202) 756-8087

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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In re Application of :

Masanobu IWASAKI, et al. :

Serial No. 09/934,474 : Group Art Unit: 3723

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For: POLISHING SOLUTION SUPPLY SYSTEM, METHOD OF SUPPLYING POLISHING SOLUTION, APPARATUS FOR AND MEHTOD OF POLISHING SEMICONDUCTOR SUBSTRATE AND METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE

APPEAL BRIEF

Commissioner for Patents
Washington, DC 20231

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed September 5, 2002.

I. REAL PARTY IN INTEREST

The real party in interest is Mitsubishi Denki Kabushiki Kaisha.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any related Appeal or Interference.

III. STATUS OF CLAIMS

Claims 1 through 19, all pending claims, have been finally rejected. It is from the final rejection of claims 1 through 19 that this Appeal is taken.

IV. STATUS OF AMENDMENTS

An Amendment pursuant to 37 C.F.R. §1.116 was filed on July 18, 2002 in response to the Final Office Action dated April 18, 2002. According to the Advisory Action dated July 26, 2002, the Amendment Under 37 C.F.R. §1.116 filed July 18, 2002 will be entered if an appeal is taken. As an appeal has been taken, Appellants are proceeding on the basis that the Amendment submitted pursuant to 37 C.F.R. §1.116 on July 18, 2002 has been entered.[1]

V. SUMMARY OF THE INVENTION

Conventional chemical mechanical polishing (CMP) techniques involve the use of a slurry containing abrasive grains and an aqueous solution of organic acid or hydrogen peroxide as an additive (page 3 of the written description of the specification, lines 26 through 28). A problem associated with such slurries is that the abrasive grains coagulate when the additive is mixed in with the abrasive slurry thereby causing the formation coarse gains having a large particle diameter (page 3 of the written description, lines 32 through 35). Such coarse grains cause undesirable scratching of the semiconductor substrate during CMP, thereby decreasing yield (page 4 of the written description, lines 3 through 6).

[1] Appellants submit herewith a second Amendment Under 35 C.F.R. §1.116 amending claim 10 to correct an inadvertent oversight by reinstating a line inadvertently dropped. A copy of the Amendment is appended hereto as Exhibit A.

The present invention addresses and solves that scratching problem stemming from coarse grains formed by coagulation of abrasive grains due to the additive by providing a method and apparatus wherein the abrasive grains are separated from the additive as well as water prior to implementing CMP as set forth in independent claims 1, 2, 10, 11, 14 and 15. Specifically, independent claims 1, 10 and 14 are directed to an apparatus, and methods wherein a mist of the abrasive slurry, a separate mist of the additive and a separate mist of pure water are sprayed into a mixing unit to form a polishing mixture which is then supplied to the surface of the polishing table for CMP. Claims 2, 11 and 15 relate to the embodiment wherein the separate mist of the abrasive, separate mist of the additive and separate mist of pure water are sprayed onto the surface polishing table and mixed thereon for CMP. The concept of separately spraying a mist of an abrasive slurry, mist of an additive and mist of pure water, whether to a mixing tank or on the surface of a polishing table is alien to the applied prior art.

VI. ISSUE

A. The Rejection:[2]

Claims 1 through 19 were rejected under 35 U.S.C. §103 for obviousness predicated upon Murphy et al. in view (presumably intending U.S. Patent No. 5,478,435) in view of Chamberlin et al.

[2] According to the Advisory Action dated July 26, 2002, the entered Amendment of July 18, 2002 overcame the rejection under the second paragraph of 35 U.S.C. §112 of claims 3, 5 and 10. Appellants note that the rejection under the second paragraph of 35 U.S.C. §112 imposed in the April 14, 2002 Final Office Action included claims 12, 13 and 16; however, claims 12, 13 and 16 were considered indefinite solely by virtue of their dependence upon claim 10. Appellants are, therefore, presuming that there is no remaining issue under the second paragraph of 35 U.S.C. §112.

B. The Issue Which Arises In This Appeal And Requires Resolution By The Honorable Board of Patent Appeals and Interferences (the Board) is:

Whether claims 1 through 19 are unpatentable under 35 U.S.C. §103 for obviousness predicated upon Murphy et al. in view of Chamberlin et al.

VII. GROUPING OF CLAIMS

The appealed claims do not stand or fall together as a group. Claims 1, 3, 5, 6 and 8 stand or fall together as a group; claims 10, 12, 13, 14, 16 and 18 stand or fall together as a group; claims 2, 4, 7, and 9 stand or fall together as a group; claims 11, 15, 17 and 19 stand or fall together as a group. The separate patentability of each of the above identified groups is advocated.

VIII. THE ARGUMENT

The Examiner recognizes that the apparatus and methodology disclosed by Murphy et al. are conspicuous by the **absence** of any disclosure or suggestion of employing a **mist**. Bearing in mind that the concepts underpinning the claimed inventions involve separately supplying a mist of an abrasive slurry, a mist of an additive and a mist of pure water, a formidable lucuna exists between the claimed invention and Murphy et al.

The Examiner then turns to Chamberlin et al. as an allegedly teaching reference. The Examiner refers to column 5, lines 45 through 51, asserting that Chamberlin et al. disclose supplying a slurry for CMP in the form a mist. The accuracy of the Examiner's determination is not denied. However, Appellants questions the relevance of the Examiner's determination to the claimed invention which does not involve spraying a mist of the ultimate slurry for CMP.

The Examiner then concluded that one having ordinary skill in the art would have been motivated to modify the apparatus and methodology of Murphy et al. by spraying a slurry onto the pad as taught by Chamberlin et al. The obvious fact should be stated--even **if** the applied references are combined as proposed by the Examiner, the claimed invention would **not** result, since none of the claims involve spraying the ultimate slurry onto the pad in the form of a mist. *Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988).*

Factual Error

As previously pointed out, each of the appealed claims encompasses the concept of providing first, second and third supply units separately for spraying and supplying a mist of an abrasive slurry, a mist of additive and a mist of pure water, respectively. None of the applied references disclose any such concept in the form of an apparatus or method steps. Accordingly, even **if** the apparatus and methodology of Murphy et al. are modified so that a mist of the ultimate slurry is sprayed onto the polishing pad, the claimed invention would **not** result. *Uniroyal, Inc. v. Rudkin-Wiley Corp., supra.* On this basis alone, the Examiner's rejection must fall as **factually erroneous.**

Appellants stress that the claimed invention is not directed to supplying a mist of a slurry. Rather, the inventions defined in each of the appealed claims requires the use of first, second and third supply units for separately spraying and supplying a **mist** of an abrasive slurry, a **mist** of additive and a **mist** of pure water, respectively, either to a mixing tank or separately onto a polishing table. It is **not** apparent and the Examiner **does not even attempt** to identify wherein either of the applied references discloses or remotely suggest the use of separate first, second and third supply units for separately spraying and supplying a **mist** of an abrasive slurry, a **mist** of

additive and a **mist** of pure water, respectively.

Claims 1, 3, 5, 6 and 8

Claims 1, 3, 5, 6 and 8 are directed to an apparatus comprising first, second and third supply units for separately spraying and supplying a mist of abrasive slurry, a mist of additive and a mist of pure water, respectively, into a mixing unit to form a polishing mixture which is supplied to the major surface of polishing table. It is not apparent and the Examiner has not identified where either of the applied references discloses or suggests such a structure.

Claims 10, 12, 13 and 14, 16 and 18

Claims 10, 12, 13, 14, 16 and 18 are directed to methods comprising the manipulative steps of separately spraying and supplying a mist comprising abrasive slurry, a mist comprising additive and a mist comprising pure water into a mixing unit, forming a polishing mixture and then supplying the polishing mixture to the major surface of the polishing table. It is not apparent and the Examiner has not identified wherein either of the applied references discloses or suggests such manipulative steps.

Claims 2, 4, 7 and 9

Claims 2, 4, 7 and 9 are directed to an apparatus comprising first, second and third supply units for spraying and supplying a mist comprising abrasive slurry, mist comprising additive and a mist comprising pure water, onto the major surface of a polishing table where the mists mix. It is not apparent and the Examiner has not identified wherein either of the applied references discloses or suggests such a structure.

Claims 11, 15, 17 and 19

Claims 11, 15, 17 and 19 are directed to methods comprising the manipulative steps of separately spraying and supplying a mist comprising abrasive slurry, a mist comprising additive and a mist comprising pure water to a specified location on the major surface of a polishing table where they mix. It is not apparent and the Examiner has identified wherein either of the applied references discloses or suggests such manipulative steps.

Indicium of Nonobviousness

The problem addressed and solved by a claimed invention merits consideration as a indicium of **nonoboviousness**. *North American Vaccine, Inc. v. American Cyanamid Co., 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); In re Newell, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); In re Nomiya, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).* As previously mentioned, the present invention addresses and solves the problem of agglomeration of course abrasive grains, due to the additive used in a conventional CMP slurry, with an attendant scratching of the semiconductor substrate and reduction in yield. This problem is not even on the radar screen of the applied references. Under such circumstances, the problem addressed and solved by the claimed invention merits consideration and anent the nonobviousness issue.

Conclusion

Based upon the foregoing, Appellants submit that the Examiner has not established a prima facie basis to deny patentability to the claimed invention under 35 U.S.C. §103 for lack of

an adequate factual basis. Indeed, neither of the applied references discloses or suggests the concept of separately spraying and supplying of a mist of abrasive slurry, a mist of additive and a mist of pure water, let alone to a mixing tank or directly to a major surface of a polishing table. Ergo, even **if** the applied references are combined, the claimed invention would **not** result. *Uniroyal, Inc. v. Rudkin-Wiley Corp., supra.* Moreover, upon giving due consideration to the problem addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obvious within the meaning of 35 U.S.C. §103. *Jones v. Hardy, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984).* Appellants, therefore, respectfully submit that the imposed rejection under 35 U.S.C. §103 is not factually or legally viable.

IX. PRAYER FOR RELIEF

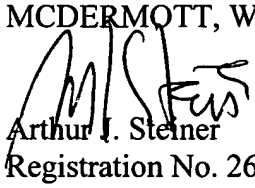
Based upon the arguments submitted supra, Appellants submit that the Examiner's rejection of claims 1 through 19 under 35 U.S.C. §103 for obviousness predicated upon Murphy et al. in view of Chamberlin et al. is not factually or legally viable. Appellants, therefore, solicit the Honorable Board to reverse the Examiner's rejection under 35 U.S.C. §103.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to

such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY



Arthur J. Steiner
Registration No. 26,106

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 AJS:ntb
Date: November 4, 2002

APPENDIX

1. (Amended) An apparatus including a polishing solution supply system, the polishing solution supply system comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof;

a first supply unit for spraying and supplying a mist comprising abrasive slurry;

a second supply unit for spraying and supplying a mist comprising additive;

a third supply unit for spraying and supplying a mist comprising pure water; and

a mixing unit for mixing the mist of abrasive slurry supplied from said first supply unit, the mist of additive supplied from said second supply unit and the mist of pure water supplied from said supply unit and the mist of pure water supplied from said third supply unit to form a polishing mixture, said mixing unit supplying the polishing mixture onto said major surface of said polishing table.

2. (Amended) An apparatus including a polishing solution supply system, the polishing solution supply system comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof;

a first supply unit for spraying and supplying a mist comprising abrasive slurry to a specified location on said major surface of said polishing table;

a second supply unit for spraying and supplying a mist comprising additive onto said major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit; and

a third supply unit for spraying and supplying a mist comprising pure water onto said

major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit and with the mist of additive supplied from said second supply unit.

3. (Twice Amended) The apparatus according to claim 1, wherein each of said supply units comprises:

a tank for storing liquid;

a pipe for supplying said liquid from said tank to said mixing unit;

a pump for supplying said liquid in said tank to said pipe at a pressure, or a gas supply unit for supplying a gas into said tank so as to supply said liquid in said tank to said pipe at a pressure;

a control unit for controlling the pressure of said liquid in said pipe at a flow rate; and

a spray unit for spraying said liquid supplied from said pipe into said mixing unit.

4. (Amended) The apparatus according to claim 2, wherein each of said supply units comprises:

a tank for storing liquid;

a pipe for supplying said liquid in said tank to said pipe at a pressure, or a gas supply unit for supplying a gas into said tank so as to supply said liquid in said tank to said pipe at a pressure;

a control unit for controlling the pressure of said liquid in said pipe; and

a spray unit for spraying said liquid supplied from said pipe onto said major surface of said polishing table.

5. (Twice Amended) The apparatus according to claim 3, wherein said control unit includes a flow meter for measuring the flow rate of liquids in said pipe, said control unit controlling a rotating speed of said pump or controlling the pressure of said gas supplied from said gas supply unit on the basis of the results of measurements by said flow meter.

6. (Amended) The apparatus according to claim 1, wherein said additive is an aqueous solution of organic acid, or an aqueous solution of organic acid, or an aqueous solution of hydrogen peroxide.

7. (Amended) The apparatus according to claim 2, wherein said additive is an aqueous solution of organic acid, or an aqueous solution of hydrogen peroxide.

8. The apparatus comprising,

according to claim 1, comprising

a carrier head for pressing said semiconductor substrate against said major surface of said polishing table.

9. The apparatus comprising,

according to claim 2, comprising

a carrier head for pressing said semiconductor substrate against said major surface of said polishing table.

10. (Four Times Amended) A method of supplying a polishing solution in an apparatus including a polishing solution supply system, the polishing solution supply system comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof; a first supply unit for spraying and supplying a mist comprising abrasive slurry; a second supply unit for spraying and supplying a mist comprising additive; a third supply unit for spraying and supplying a mist comprising pure water; and a mixing unit for mixing the mist of abrasive slurry unit supplied from said first supply unit, the mist of additive supplied from the second supply unit and the mist of pure water supplied from said third supply unit to form a polishing a mixture, said mixing unit supplying the polishing mixture onto said major surface of said polishing table, the method comprising:

spraying and supplying each of said mist comprising abrasive slurry, said mist comprising additive and said mist comprising pure water into said mixing unit, and mixing them in said mixing unit to form a polishing mixture; and

supplying the polishing mixture onto said major surface of said polishing table.

11. A method of supplying a polishing solution in an apparatus including a polishing solution supply system, the polishing solution supply system, comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof;

a first supply unit for spraying and supplying a mist comprising abrasive slurry to a specified location on said major surface of said polishing table;

a second supply unit for spraying and supplying a mist comprising additive onto said

major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit; and

a third supply unit for spraying and supplying a mist comprising pure water onto said major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit and with the mist of additive supplied from said second supply unit, the method comprising spraying and supplying each of said mist comprising abrasive slurry, said mist comprising additive and said mist comprising pure water onto said major surface of said polishing table so as to mix with each other.

12. The method of supplying a polishing solution according to claim 10, further comprising:

measuring a quantity of each of said abrasive slurry, additive and pure water; and

controlling a supply pressure of each of said abrasive slurry, said additive and said pure water to a desired value on the basis of the results of measurement.

13. The method of supplying a polishing solution according to claim 10, further comprising supplying pure water to said mixing unit, when said abrasive slurry is not supplied to said mixing unit for a specified period of time.

14. (Amended) A method of polishing a semiconductor substrate in an apparatus including a polishing solution supply system, the polishing solution supply system comprising: a polishing table for placing a semiconductor substrate on a major surface thereof; a first supply unit for spraying and supplying a mist comprising slurry; a second supply unit for spraying and

supplying a mist comprising additive; a third supply unit for spraying and supplying a mist comprising pure water; and a mixing unit for mixing the mist of abrasive slurry supplied from said first supply unit, the mist of additive supplied form said second supply unit and the mist of pure water supplied from said third supply unit to form a polishing mixture, said mixing unit supplying the polishing mixture onto said major surface of said polishing table; and a carrier head for pressing said semiconductor substrate against said major surface of said polishing table, while pressing the semiconductor substrate against said polishing table using said carrier head, the method comprising:

spraying and supplying each of said abrasive slurry, said additive, and said pure water into said mixing unit, and mixing them in said mixing unit; and

supplying the mixture onto said major surface of said polishing table.

15. (Amended) A method of polishing a semiconductor substrate in an apparatus including a polishing solution supply system, the polishing solution supply system comprising: a polishing table for placing a semiconductor substrate on a major surface thereof; a first supply unit for spraying and supplying a mist comprising abrasive slurry to a specified location on said major surface of said polishing table; a second supply unit for spraying and supplying a mist comprising additive onto said major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit; and a third supply unit for spraying and supplying a mist comprising pure water onto said major surface of said polishing table so as to mix with the mist of abrasive slurry supplied from said first supply unit and with the mist of additive supplied from said second supply unit; and a carrier head for pressing said semiconductor substrate against said major surface of said polishing table, while pressing the

semiconductor substrate against said polishing table using said carrier head,

spraying and supplying each of said abrasive slurry, said additive, and said pure water onto said major surface of said polishing table so as to mix with each other.

16. (Amended) The method according to claim 10, comprising supplying the polishing solution during manufacturing a semiconductor device.

17. (Amended) The method according to claim 11, comprising spraying and supplying said mist comprising abrasive slurry, said mist comprising additive and said mist comprising pure water during manufacturing a semiconductor device.

18. (Amended) The method according to claim 14, further comprising manufacturing a semiconductor device using the semiconductor substrate.

19. (Amended) The method according to claim 15, further comprising manufacturing a semiconductor device using the semiconductor substrate.

EXHIBIT A

No.: 50090-334

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	: **RESPONSE UNDER 37 CFR 1.116**
	: **EXPEDITED PROCEDURE**
Masanobu IWASAKI, et al.	:
	:
Serial No.: 09/934,474	: Group Art Unit: 3723
	:
Filed: August 23, 2001	: Examiner: H. Shakeri
	:

For: POLISHING SOLUTION SUPPLY SYSTEM, METHOD OF SUPPLYING POLISHING SOLUTION, APPARATUS FOR AND METHOD OF POLISHING SEMICONDUCTOR SUBSTRATE AND METHOD OF MANUFACTURING SEMICONDUCTOR DEVICE

SECOND AMENDMENT UNDER 37 CFR §1.116

Box AF
Commissioner for Patents
Washington, DC 20231

Sir:

The following Amendment and Remarks are submitted in further response to the Office Action dated April 18, 2002 correcting a clerical oversight in the Amendment purusant to 37 C.F.R. §1.116 submitted July 18, 2002.

IN THE CLAIMS:

Please amend claim 10 as follows.

10. (Four Times Amended) A method of supplying a polishing solution in an apparatus including a polishing solution supply system, the polishing solution supply system comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof;

a first supply unit for spraying and supplying a mist comprising abrasive slurry; a second supply unit for spraying and supplying a mist comprising additive; a third supply unit for spraying and supplying a mist comprising pure water; and a mixing unit for mixing the mist of abrastive slurry supplied form said first supply unit, the mist of additive supplied from the second supply unit and the mist of pure water supplied from said third supply unit to form a polishing a mixture, said mixing unit supplying the polishing mixture onto said major surface of said polishing table[;], the methjod comprising:

spraying and supplying each of said mist comprising abrasive slurry, said mist comprising additive and said mist comprising pure water into said mixing unit, and mixing them in said mixing unit to form a polishing mixture; and

supplying the polishing mixture onto said major surface of said polishing table.

REMARKS

Claims 1 through 19 are pending in this application. Claim 10 has been amended. Care has been exercised to avoid the introduction of new matter. Specifically, the present Amedment merely reinserts text from previous claim 10 which was inadvertently omitted due to a clerical oversight. Applicants submit that the present Amendment does not generate any new matter.

A clean copy of amended claim 10 appears in the Appendix hereto.

For reasons set forth in the previous Amendment submitted July 18, 2002 and for the reasons set forth in the Appeal Brief submitted concurrently herewith, Applicants submit that the imposed rejeciton under 35 U.S.C. §103 is not factually or legally viable and, hence, solicit withdrawal thereof.

imposed rejeciton under 35 U.S.C. §103 is not factually or legally viable and, hence, solicit withdrawal thereof.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Arthur J. Steiner
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600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 AJS:ntb
Facsimile: (202) 756-8087
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APPENDIX

10. (Four Times Amended) A method of supplying a polishing solution in an apparatus including a polishing solution supply system, the polishing solution supply system comprising:

a polishing table for placing a semiconductor substrate on a major surface thereof;

a first supply unit for spraying and supplying a mist comprising abrasive slurry; a second supply unit for spraying and supplying a mist comprising additive; a third supply unit for spraying and supplying a mist comprising pure water; and a mixing unit for mixing the mist of abrastive slurry supplied form said first supply unit, the mist of additive supplied from the second supply unit and the mist of pure water supplied from said third supply unit to form a polishing a mixture, said mixing unit supplying the polishing mixture onto said major surface of said polishing table, the methjod comprising:

spraying and supplying each of said mist comprising abrasive slurry, said mist comprising additive and said mist comprising pure water into said mixing unit, and mixing them in said mixing unit to form a polishing mixture; and

supplying the polishing mixture onto said major surface of said polishing table.